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(54) AN IMPROVED DISPENSING DEVICE FOR USE WITH OR INCLUDING AN AEROSOL DISPENSING CONTAINER

(71) We, RIKER LABORATORIES, INC., a Corporation organized and existing under the laws of the State of Delaware, United States of America, of 19901 Nordhoff Street, Northridge, California, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a dispensing device which is particularly suited for dispensing and administering measured amounts of fluids. The prinicpal use for such a device may be in dispensing metered amounts of a medicament-containing aerosol for inhalation therapy.

A dispensing apparatus may be manually actuated to a cocked or charging position during which a measured quantity of the material to be dispensed may be metered into a metering chamber. The outlet or mouthpiece of the device may then be placed in the patient's mouth so that the initiation of inhalation triggers the mechanism, dispensing the metered amount of material directly into the mouth.

The invention provides a dispensing device for use in combination with an aerosol dispensing container charged with a self-propelling liquid composition and equipped with a metering valve movable between charging and discharging positions and having a discharge tube at one end thereof, which device includes: a housing arranged to receive said container for reciprocation therein, said housing having an air passage therethrough; a support member having an opening for receiving said discharge tube and providing a discharge passage for said tube into said air passage; a spring carried in said housing and engageable with said container for urging said container toward said support member and said valve toward said discharging position, said spring being compressible to a cocked position permitting movement of said charging position and movement of said container away from said support member; a cam mounted in said housing for rotation between a first and a second position, movement of said cam in a first direction to said first position, when a container is located with the housing, being adapted to move said metering valve of the container to said charging position and said container away from said support member, and with said spring urging said cam in a second and opposite direction toward said second position when a container is located within the housing; a lever carried by said housing and engageable with said cam for moving said cam in said first direction; and actuating means positioned in said air passage and movable between first and second positions and including a latch engageable with said cam when in said first position to prevent movement of said cam in said second direction and latch said spring in said cocked position when a container is located within the housing, whereby a pressure differential across said actuating means in said air passage moves said actuating means to said second position, tripping the latch and permitting movement of said cam in said second direction and movement of said valve means to the discharging position.

According to one feature of the invention said cam comprises a cylindrically formed member disposed in said air passage and includes a relieved portion for maintaining said passage open.

According to another feature of the invention said lever comprises a mouthpiece pivotally mounted on said housing and forming a portion of said air passage.

According to yet another feature of the invention said spring is adapted to be positioned between said housing and said container when a container is located within the housing for continuously urging said container toward said support member and said valve toward said discharging position.

In one form of the invention there is a second lever mounted in said housing and manually movable from an inoperative position to an operative position, and in which said spring

is adapted to be positioned between said second lever and said container when a container is located within the housing for urging said container toward said support member and sad valve toward said discharging position when said second lever is in said operative position.

Preferably said actuating means comprises a vane mounted in said housing and movable from said first position substantially blocking said air passage to said second position not blocking said air passage, said vane including the aforesaid cam-engaging element engageable with said cam when in said first position to prevent movement of said cam in said second direction.

In this preferred form said cam comprises a cylindrically formed member disposed in said air passage and includes a relieved portion for maintaining said air passage open, and said lever engageable with said cam comprises a mouthpiece forming a portion of said air passage pivotably mounted on said housing for movement in said first direction from a discharging position at which said mouthpiece engages said cam when said cam is in said second position to a charging position in engagement with and positioning said cam in said first position for engagement of said cam by said latch, said mouthpiece being pivotable from said charging to said discharging position out of engagement with said cam to afford free movement of said cam in said second direction upon release of said latch.

In this last mentioned form it is preferred that said air passage includes a compartment having an inlet and an adjacent outlet with said vane mounted therebetween for movement in said compartment between said first and second positions, and with said outlet communicating with said mouthpiece via said relieved portion of the cam said device including a second spring urging said vane to said first position, and said compartment including a recessed section located adjacent a free end of said vane when in said second position permitting air flow around said free end, said vane and housing including interengaging means for spacing said vane from said housing when said vane is in said second position.

The invention also provides in a dispensing device, the combination of a housing including an aerosol dispensing container charged with a self-propelling liquid composition, said housing including means defining an air passage therethrough; a metering valve coupled to said container and movable between a charging position for receiving a charge from said container and a discharging position for dispensing said charge; a spring carried in said housing for urging said valve toward said discharging position, with said spring being compressible to a cocked position permitting movement of said valve to said charging position; a cam rotatably mounted in said housing with movement of said cam in a first direction moving said valve to said charging position and said spring to said cocked position, with said spring urging said cam in a second opposite direction; a lever carried by said housing and engageable with said cam for moving said cam in said first direction; and actuating means positioned in said air passage and movable between first and second positions and including a cam-engaging element engageable with said cam when in said first position to prevent movement of said cam in said second direction, whereby a pressure differential in said air passage across said actuating means moves said actuating means to said second position, permitting movement of said cam in said second direction and movement of said valve means to the discharging position.

According to a feature of the last mentioned arrangement said lever comprises a mouthpiece pivotally mounted on said housing and forming a portion of said air passage, with said valve dispensing said charge into said mouthpiece.

Two specific embodiments of the invention will now be described by way of example with reference to and as shown in the accompanying drawings of which:—

Figure 1 is a sectional view of a first embodiment of a dispensing device showing the device in the charging position;

Figures 2, 3, 4 and 5 are sectional views taken along the lines 2—2, 3—3, 4—4 and 5—5, respectively, of Figure 1;

Figure 6 is a sectional view taken along the line 6—6 of Figure 1;

Figures 7, 8, 9 and 10 are sectional views corresponding to Figures 2, 3, 4 and 5, respectively, showing the device in the discharging position;

Figure 11 is an enlarged perspective view of the cam of the device of Figure 1;

Figure 12 is a sectional view similar to that of Figure 1 showing a second embodiment of the device of the invention; and

Figure 13 is a partial sectional view of the deive of Figure 12 showing a second lever in the operative position.

Referring to the device of Figures 1 to 11, a container 20 is positioned in a compartment 21 of a housing 22. A lever 23 is pivotally mounted on a pin 24 at the upper end of the compartment 21. The upper end of the housing is closed by a J-shaped member 26 laterally slidable in grooves 27 of the housing 22. The portion 28 of the member 26 closes the upper end of another compartment 29 of the housing (Figures 1 to 3). A spring 30 is carried on a boss 31 of the lever 23.

With the J-shaped member 26 removed and the lever 23 pivoted to a vertical position, the container 20 may be slidably inserted into or removed from the housing 22. With the container in the compartment 21, the lever 23 is pivoted to the horizontal position of Figure

1 and is manually held down compressing the spring 30. The member 26 is then slid into position as shown in Figure 1, holding the lever 23 in the horizontal position.

The container 20 may be a conventional aerosol dispensing container and a typical container is described in U.S. Patent Specification No. 3,001,524. A metering valve 34 is incorporated in the container 20 and includes a stem with a tubular outer end 35 forming a discharge tube. The valve construction is conventional and reference may be made to the aforesaid patent specification for details of construction and operation. The tubular end 35 of the valve enters a support member 36 formed at the lower end of the housing 22. A discharge passage 37 is provided in the member 36 for communication between the valve and the interior of a mouthpiece 38 (Figures 5 and 10). The container is preferably but not necessarily removable and replaceable.

With the valve and container in the charging position of Figures 1 to 5, a measured amount of the fluid in the container is introduced into a metering chamber of the valve. When the valve and container are moved to the discharging position of Figures 7 to 10, this measured amount of fluid is dispensed from the valve through the tubular end 35 into the mouthpiece 38.

The mouthpiece 38 is mounted on the housing 22 with a pin 42 and a cam 43 for pivoting between the position of Figures 1 to 5 and the position of Figures 7 to 10. The pin 42 is fixed to the mouthpiece 38 and pivots in the lower portion of the housing 22. The cam 43 rotates on shaft portions 44, 45 (Figure 11), with the shaft portion 44 pivoting in the lower portion of the housing 22 and with the shaft portion 45 pivoting in a plug 46 fixed to the mouthpiece 38.

A pin 50 projects radially outward from the cam 43 (Figures 2 and 7) and rides in a slot 51 formed in the lower portion of the housing 22. A boss 52 of the mouthpiece 38 rides in the slot 51 below the pin 50.

A slide member 55 is positioned in a groove in the lower portion of the housing 22 for axial sliding motion relative to the housing (Figures 11 and 4). A pin 56 is positioned in the housing and passes through a vertically disposed slot in the slide member 55 serving as an additional guide for the slide member. The upper end of the slide member 55 engages the container 20 and the lower end has a rounded projection which rides on a surface 57 of the cam 43 (Figure 4).

A pressure-operated actuating element is provided for controlling the dispensing operation. Typically this may comprise a vane member in the form of a flapper 59 which is pivotally mounted in the compartment 29 of the housing on the pin 56 (Figures 1, 3 and 8). A small spring 60 is positioned between the flapper 59 and a wall of the compartment 22 for urging the flapper 59 counterclockwise as viewed in the drawings, to the position of Figure 3. A boss 58 may be formed on the flapper 59 for receiving one end of the spring 60. A hook member 61 is formed on the flapper for engaging a notch 62 of the cam 43.

An air passage is provided through the device and includes an inlet 64 to the compartment 29, a recess 65 in the portion 28 of the member 26, an outlet 66 from the compartment 29, a relieved portion 67 on the cam 43, and the mouthpiece 38 (Figure 7). The flapper 59 is shaped so that in the position of Figures 2 and 3, the flapper substantially closes the air passage. When the flapper is in the position of Figures 7 and 8, air flow may occur over the end of the flapper via the recess 65. Means may be provided for spacing the upper end of the flapper from the wall of the compartment when in the position of Figures 7 and 8. Typically this means may comprise a rib 69 on the flapper, with this rib engaging the wall of the compartment and spacing the remainder of the flapper from the wall.

The operation of the device may be followed by assuming that a metered dose has just been dispensed and the mechanism is in the position of Figures 7 to 10. The mouthpiece 38 is manually rotated from the angled position to the aligned position of Figures 1 to 5. The mouthpiece functions as a lever and engages the pin 50, rotating the cam from the position of Figure 7 to the position of Figure 2. This cam rotation moves the sliding member 55 upward from the position of Figure 9 to the position of Figure 4, thereby moving the container 20 upward, compressing the spring 30 and placing the valve and container in the charging condition. After the cam is rotated from the position of Figure 8 to the position of Figure 3, the flapper 59 may be moved to the position of Figure 3 with the hook 61 engaging the notch 62. The spring 30 is now compressed or cocked and the mechanism is latched in the charging position.

When the patient wishes to administer another dose, the mouthpiece is moved to the angled position and is placed in the patient's mouth. This movement of the mouthpiece moves the boss 52 downward in the slot 51, providing space for subsequent movement of the pin 50, but the cam remains latched in place. When the patient starts to inhale through the mouthpiece, a pressure differential is created across the flapper 59 causing clockwise rotation of the flapper This flapper movement removes the hook 61 from the notch 62 of the cam and the cam is rotated by the force applied by the spring 30 through the container 20 and the slide member 55, to the position of Figure 9. The downward motion of the container moves the valve to the discharging position and a metered dose is dispensed through the tubular end 35 and the passage 37 into the mouthpiece 38 for mixing

with the air being inhaled by the patient through the air passage of the device.

An alternative form of the dispensing device is illustrated in Figures 12 and 13, wherein components corresponding to those of the embodiment of Figures 1 to 11 are identified by the same reference numerals. An extension 70 of the lever 23 is disposed in a compartment 71 of the housing, with a portion of the extension 70 projecting out of the housing through an opening 72. The lever 23 is pivotal between the position of Figure 12 and the position of Figure 13 and is intended to be manually moved to the position of Figure 13 compressing the spring 30. When the device is in the condition of Figure 12, the spring 30 is relaxed or substantially relaxed so that it will not produce a discharge when the flapper 59 is moved by inhalation. When the lever 70 is in the position of Figure 13,the spring 30 is in the compressed or cocked condition and the device is ready for operation in the same manner as the earlier described embodiment.

If desired, a cover may be provided for the mouthpiece and air passage inlet for protecting the the mechanism when not in use. A typical cover 75 is shown in phantom lines on Figure 13 and may be slidably positioned over the mouthpiece in abutting relation with a shoulder 76 of the housing providing a smooth exterior for the device. A similar housing may be used with the device of Figure 1 if desired. The cover also maintains the device in the aligned position where operation is impossible. This prevents inadvertent discharge during storage or when carried by user.

The devices described above are sensitive and substantially foolproof in operation and require little of the patient in the way of manipulative ability or strength or coordination.

These dispensing devices are suitable for use with replaceable aerosol dispensing containers and the user can readily remove a used container and install a fresh container.

WHAT WE CLAIM IS:—

1. A dispensing device for use in combination with an aerosol dispensing container charged with a self-propelling liquid composition and equipped with a metering valve movable between charging and discharging positions and having a discharge tube at one end thereof, which device includes: a housing arranged to receive said container for reciprocation therein, said housing having an air passage therethrough, a support member having an opening for receiving said discharge tube and providing a discharge passage for said tube into said air passage; a spring carried in said housing and engageable with said container for urging said container toward said support member and said valve toward said discharging position, said spring being compressible to a cocked position permitting movement of said valve to said charging position and movement of said container away from said support member; a cam mounted in said housing for rotation between a first and a second position, movement of said cam in a first direction to said first position, when a container is located within the housing, being adapted to move said metering valve of the container to said charging position and said container away from said support member, and said spring urging said cam in a second and opposite direction toward said second position when a container is located within the housing; a lever carried by said housing and engageable with said cam for moving said cam in said first direction; and actuating means positioned in said air passage and movable between first and second positions and incuding a latch engageable with said cam when in said first position to prevent movement of said cam in said second direction and latch said spring in said cocked position when a container is located with the housing, whereby a pressure differential across said actuating means in said air passage moves said actuating means to said second position, tripping the latch and permitting movement of said cam in said second direction and movement of said valve means to the discharging position.

2. A device as claimed in claim 1 in which said cam comprises a cylindrically formed member disposed in said air passage and includes a relieved portion for maintaining said passage open.

3. A device as claimed in claim 1 or claim 2 in which said lever comprises a mouthpiece pivotally mounted on said housing and forming a portion of said air passage.

4. A device as claimed in any one of the preceding claims in which said spring is adapted to be positioned between said housing and said container when a container is located within the housing for continuously urging said container toward said support member and said valve toward said discharging position.

5. A device as claimed in claim 1 and including a second lever mounted in said housing and manually movable from an inoperative position to an operative position, and in which said spring is adapted to be positioned between said second lever and said container when a container is located within the housing for urging said container toward said support member and said valve toward said discharging position when said second lever is in said operative position.

6. A device as claimed in any one of the preceding claims in which said actuating means comprises a vane mounted in said housing and movable from said first position substantially blocking said air passage to said second position not blocking said air passage, said vane including the aforesaid cam-engaging element engageable with said cam when in said

first position to prevent movement of said cam in said second direction.

7. A device as claimed in claim 6 in which said cam comprises a cylindrically formed member disposed in said air passage and includes a relieved portion for maintaining said air passage open, and said lever engageable with said cam comprises a mouthpiece forming a portion of said air passage pivotably mounted on said housing for movement in said first direction from a discharging position at which said mouthpiece engages aid cam when said cam is in said second position to a charging position in engagement with and positioning said cam in said first position for engagement of said cam by said latch, said mouthpiece being pivotable from said charging to said discharging position out of engagement with said cam to afford free movement of said cam in said second direction upon release of said latch.

8. A device as claimed in claim 7 in which said air passage includes a compartment having an inlet and an adjacent outlet with said vane mounted therebetween for movement in said compartment betwee said first and second positions, and with said outlet communicating with said mouthpiece via said relieved portion of the cam; said device including a second spring urging said vane to said first position, and said compartment including a recessed section located adjacent a free end of said vane when in said second position permitting air flow around said free end, said vane and housing including interengaging means for spacing said vane from said housing when said vane is in said second position.

9. In a dispensing device, the combination of a housing including an aerosol dispensing container charged with a self-propelling liquid composition, said housing including means defining an air passage therethrough; a metering valve coupled to said container and movable between a charging position for receiving a charge from said container and a discharging position for dispensing said charge; a spring carried in said housing for urging said valve toward said discharging position, with said spring being compressible to a cocked position permitting movement of said valve to said charging position; a cam rotatably mounted in said housing with movement of said cam in a first direction moving said valve to said charging position and said spring to said cocked position, with said spring urging said cam in a second opposite direction; a lever carried by said housing and engageable with said cam for moving said cam in said first direction; and actuating means positioned in said air passage and movable between first and second positions and including a cam-engaging element engageable with said cam when in said first position to prevent movement of said cam in said second direction, whereby a pressure differential in said air passage across said actuating means moves said actuating means to said second position, permitting movement of said cam in said second direction and movement of said valve means to the discharging position.

10. A device as claimed in claim 9 in which said lever comprises a mouthpiece pivotally mounted on said housing and forming a portion of said air passage, with said valve dispensing said charge into said mouthpiece.

11. A device substantially as hereinbefore described with reference to and as shown in Figures 1 to 11 of the accompanying drawings.

12. A device as claimed in claim 11, modified as hereinbefore described with reference to and as shown in Figures 12 and 13 of the accompanying drawings.

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2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 1

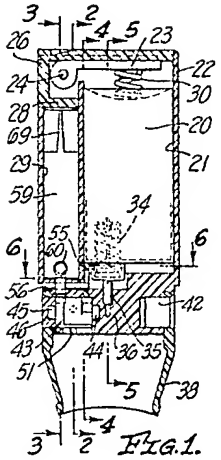

FIG. 1.

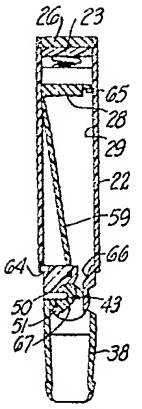

FIG. 2.

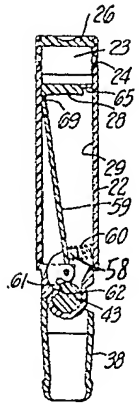

FIG. 3.

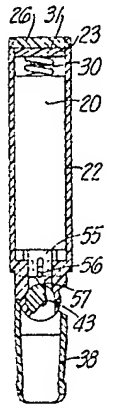

FIG. 4.

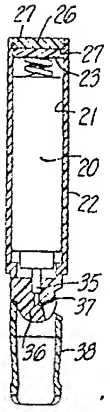

FIG. 5.

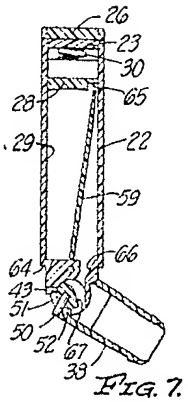

FIG. 7.

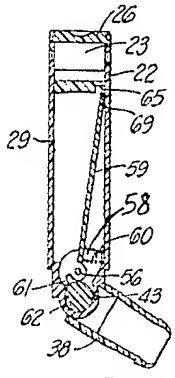

FIG. 8.

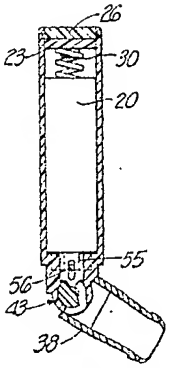

FIG. 9.

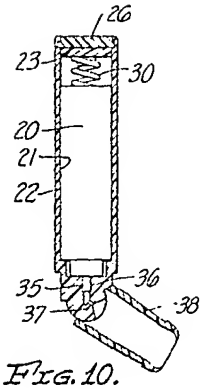

FIG. 10.

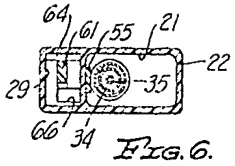

FIG. 6.

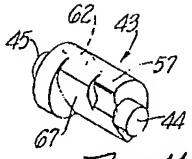

FIG. 11

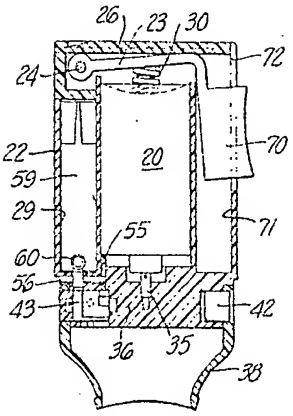

FIG. 12.

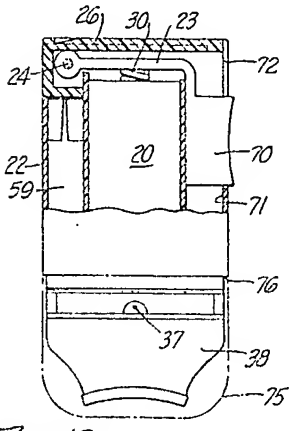

FIG. 13.